

Section I. (Amendments to the Claims):

Cancel claims 24-28, 30-35, 39-40 and 84-141, and add new claims 142-255, as set out in the following listing of claims 1-255.

1-141. (Cancelled).

142. (New) A method for culturing cells and producing a product of interest comprising:

- (a) providing a cell culture device comprising:
 - (i) a reservoir comprising a culture medium fluid;
 - (ii) a tangential flow growth device in fluid communication with said reservoir, comprising:
 - (1) a housing enclosing an interior volume;
 - (2) one or more hollow fiber membranes separating the interior volume of the housing into an intercapillary space and an extracapillary space;
 - (3) at least one inlet port and at least one outlet port in fluid communication with the intercapillary space; and
 - (4) at least one port in fluid communication with the extracapillary space;
 - (iii) a tangential flow membrane device in fluid communication with said reservoir and said tangential flow growth device, comprising:
 - (1) a housing enclosing an interior volume;
 - (2) one or more membranes separating the interior volume of the housing into a first set of one or more chambers and a second set of one or more chambers;
 - (3) at least one inlet port and at least one outlet port in fluid communication with the first set of one or more chambers; and
 - (4) at least one port in fluid communication with the second set of one or more chambers;
- (b) inoculating the extracapillary space of the tangential flow growth device with cells capable of producing the product of interest;

- (c) flowing the culture medium fluid through a flow path defined by the reservoir, the intercapillary space of the tangential flow growth device, and the first set of one or more chambers of the tangential flow membrane device;
- (d) monitoring components and/or conditions of the culture medium fluid;
- (e) adding one or more substances selected from the group consisting of oxygen, carbon dioxide, serum, glucose, nutrients, and fresh culture medium into said culture medium fluid;
- (f) collecting the culture medium fluid that contains the product of interest.

143. (New) The method of claim 142, wherein oxygen is added into said culture medium fluid.

144. (New) The method of claim 142, wherein said one or more substances are added into said culture medium fluid along said flow path.

145. (New) The method of claim 142, wherein said one or more substances are added into said culture medium fluid through said at least one port in fluid communication with the extracapillary space of the tangential flow growth device.

146. (New) The method of claim 142, wherein said one or more substances are added into said culture medium fluid through said at least one port in fluid communication with the second set of one or more chambers of the tangential flow membrane device.

147. (New) The method of claim 142, wherein said tangential flow membrane device comprises one or more hollow fiber membranes, wherein the first set of one or more chambers of said tangential flow membrane device comprise intercapillary space within said one or more hollow fiber membranes, and wherein the second set of one or more chambers of said tangential flow membrane device comprise extracapillary space outside of said one or more hollow fiber membranes.

148. (New) The method of claim 142, wherein the cell culture device comprises multiple auxiliary reservoirs for storing said one or more substances and adding same into said culture medium fluid.

149. (New) The method of claim 142, wherein the culture medium fluid containing the product of interest is collected from at least one collection locus selected from the group consisting of:

- (i) the flow path for said culture medium fluid;
 - (ii) the extracapillary space of the tangential flow growth device; and
 - (iii) the second set of one or more chambers of the tangential flow membrane device.
150. (New) The method of claim 142, further comprising the step of treating the collected culture medium fluid that contains the product of interest, by a process selected from the group consisting of concentrating, separating, and dialyzing.
151. (New) The method of claim 150, wherein a filter device is used for treatment of the collected culture medium fluid containing the product of interest.
152. (New) The method of claim 151, wherein said filter device comprises a microporous filter and/or an ultrafilter.
153. (New) The method of claim 151, wherein said filter device comprises a tangential flow filtration element.
154. (New) The method of claim 142, further comprising the step of filtering the collected culture medium fluid with a microporous filter and/or an ultrafilter to yield a filtered fluid containing the product of interest.
155. (New) The method of 142, further comprising the step of filtering the collected culture medium fluid with a tangential flow filtration element to yield a filtered or concentrated fluid containing the product of interest.
156. (New) The method of claim 142, wherein said cell culture device comprises a switchable flow control device arranged to control flow direction of the culture medium fluid through the flow path.
157. (New) The method of claim 156, wherein the flow direction of the culture medium fluid through the flow path is alternated by said switchable flow control device.
158. (New) The method of claim 156, wherein the switchable flow control device is selected from the group consisting of (i) reversible pump, (ii) 4-way valve, (iii) a series of valves and (iv) reservoirs.

159. (New) The method of claim 142, further comprising the step of mixing culture medium fluid in the extracapillary space of the tangential flow growth device.
160. (New) The method of claim 159, wherein said mixing is effected by a switchable flow control device arranged to control flow direction of the culture medium therethrough.
161. (New) The method of claim 160, wherein said switchable flow control device comprises a reversible pump.
162. (New) The method of claim 142, wherein the culture medium fluid is formulated for culturing cells selected from the group consisting of animal cells, human host cells, bacteria, mycobacteria, mycoplasma, and yeast.
163. (New) The method of claim 142, wherein the product of interest is selected from the group consisting of cells, bacteria, viruses, viral particles, intracellular products, extracellular products, IgG, immunoglobulins, hormones, proteins, amino acids, and macromolecules.
164. (New) The method of claim 142, wherein the cell culture device comprises multiple hollow fiber tangential flow growth devices arranged in parallel.
165. (New) The method of claim 142, wherein the cell culture device comprises multiple tangential flow membrane devices arranged in parallel.
166. (New) The method of claim 142, wherein membrane porosity of the one or more hollow fiber membranes of the tangential flow growth device is selected by considering growth requirements of the cells to be inoculated in the extracapillary space of said tangential flow growth device.
167. (New) The method of claim 166, wherein said one or more hollow fiber membranes are characterized by a pore size of about 0.2 micron.
168. (New) The method of claim 166, wherein said one or more hollow fiber membranes are characterized by about 10,000 molecular weight cutoff.
169. (New) The method of claim 142, wherein the cell culture device further comprises a peristaltic pump for flowing the culture fluid medium through the flow path.

170. (New) A method for culturing cells and producing a product of interest comprising:
- (a) providing a cell culture device comprising:
 - (i) a reservoir comprising a culture medium fluid;
 - (ii) a tangential flow growth device in fluid communication with said reservoir, comprising:
 - (1) a housing enclosing an interior volume;
 - (2) one or more membranes separating the interior volume of the housing into a first set of one or more chambers and a second set of one or more chambers;
 - (3) at least one inlet port and at least one outlet port in fluid communication with the first set of one or more chambers; and
 - (4) at least one port in fluid communication with the second set of one or more chambers;
 - (iii) a tangential flow membrane device in fluid communication with said reservoir and said tangential flow growth device, comprising:
 - (1) a housing enclosing an interior volume;
 - (2) one or more membranes separating the interior volume of the housing into a first set of one or more chambers and a second set of one or more chambers;
 - (3) at least one inlet port and at least one outlet port in fluid communication with the first set of one or more chambers; and
 - (4) at least one port in fluid communication with the second set of one or more chambers;
 - (b) inoculating the second set of one or more chambers of the tangential flow growth device with cells capable of producing the product of interest;
 - (c) flowing the culture medium fluid through a flow path defined by the reservoir, the first set of one or more chambers of the tangential flow growth device, and the first set of one or more chambers of the tangential flow membrane device;
 - (d) monitoring components and/or conditions of the culture medium fluid; and
 - (e) adjusting the components of the culture medium fluid, by adding one or more substances into said culture medium fluid.
171. (New) The method of claim 170, further comprising the step of collecting the culture medium fluid that contains the product of interest.

172. (New) The method of claim 171, further comprising the step of treating the collected culture medium fluid that contains the product of interest, by a process selected from the group consisting of concentrating, separating, and dialyzing.
173. (New) The method of claim 172, wherein a filter device is used for treatment of the collected culture medium fluid containing the product of interest.
174. (New) The method of claim 173, wherein said filter device comprises a microporous filter and/or an ultrafilter.
175. (New) The method of claim 173, wherein said filter device comprises a tangential flow filtration element.
176. (New) The method of claim 171, further comprising the step of filtering the collected culture medium fluid with a microporous filter and/or an ultrafilter to yield a filtered fluid containing the product of interest.
177. (New) The method of 171, further comprising the step of filtering the collected culture medium fluid with a tangential flow filtration element to yield a filtered or concentrated fluid containing the product of interest.
178. (New) The method of claim 170, wherein said tangential flow growth device comprises one or more hollow fiber membranes, wherein the first set of one or more chambers of said tangential flow growth device comprise intercapillary space within said one or more hollow fiber membranes, and wherein the second set of one or more chambers of said tangential flow growth device comprise extracapillary space outside of said one or more hollow fiber membranes.
179. (New) The method of claim 170, wherein said tangential flow membrane device comprises one or more hollow fiber membranes, wherein the first set of one or more chambers of said tangential flow membrane device comprise intercapillary space within said one or more hollow fiber membranes, and wherein the second set of one or more chambers of said tangential flow membrane device comprise extracapillary space outside of said one or more hollow fiber membranes.

180. (New) The method of claim 170, wherein said one or more substances are added into said culture medium fluid further through said at least one port in fluid communication with the second set of one or more chambers of the tangential flow growth device.
181. (New) The method of claim 170, wherein the cell culture device comprises multiple auxiliary reservoirs for storing said one or more substances and adding same into said culture medium fluid.
182. (New) The method of claim 170, wherein said cell culture device comprises a switchable flow control device for controlling flow direction of the culture medium fluid through the flow path.
183. (New) The method of claim 182, wherein the flow direction of the culture medium fluid through the flow path is alternated by said switchable flow control device.
184. (New) The method of claim 182, wherein the switchable flow control device is selected from the group consisting of (i) reversible pump, (ii) 4-way valve, (iii) a series of valves and (iv) reservoirs.
185. (New) The method of claim 170, further comprising the step of mixing culture medium fluid in the second set of one or more chambers of the tangential flow growth device.
186. (New) The method of claim 185, wherein said mixing is effected by a switchable flow control device arranged to control flow direction of the culture medium therethrough.
187. (New) The method of claim 186, wherein said switchable flow control device comprises a reversible pump.
188. (New) A method for culturing cells and producing a product of interest comprising:
- (a) providing a cell culture device comprising:
 - (i) a tangential flow device comprising:
 - (1) a housing enclosing an interior volume;
 - (2) one or more membranes separating the interior volume of the housing into a first set of one or more chambers and second set of one or more chambers;
 - (3) at least one inlet port and at least one outlet port in fluid communication with the first set of one or more chambers; and

- (4) at least one port in fluid communication with the second set of one or more chambers;
 - (b) circulating a first culture medium fluid through the first set of one or more chambers of the tangential flow device;
 - (c) generating a permeate of the first culture medium fluid as a second fluid in the second set of one or more chambers of the tangential flow device;
 - (d) culturing cells to produce the product of interest; and
 - (e) collecting the first culture medium fluid and/or second fluid that contains the product of interest.
189. (New) The method of claim 188, wherein direction of said first culture medium fluid in said first set of one or more chambers of the tangential flow device is alternated by a switchable flow control device.
190. (New) The method of claim 189, wherein the switchable flow control device is selected from the group consisting of (i) reversible pump, (ii) 4-way valve, and (iii) a series of valves and (iv) reservoirs.
191. (New) The method of claim 188, wherein flow direction of said second fluid in said second set of one or more chambers is alternated by a switchable flow control device.
192. (New) The method of claim 191, wherein said switchable flow control device is selected from the group consisting of (i) reversible pump, (ii) 4-way valve, and (iii) a series of valves and (iv) reservoirs.
193. (New) The method of claim 188, further comprising the steps of monitoring the components and/or conditions of the first culture medium fluid and/or second fluid, and adding one or more substances selected from the group consisting of oxygen, carbon dioxide, serum, glucose, nutrients, and fresh culture medium into said first culture medium fluid and/or second fluid.
194. (New) The method of claim 193, wherein the cell culture device comprises multiple reservoirs for storing said one or more substances and adding same into said first culture medium fluid and/or second fluid.

195. (New) The method of claim 188, further comprising the step of treating the collected first culture medium fluid and/or second fluid that contains the product of interest, by a process selected from the group consisting of concentrating, separating, and dialyzing.
196. (New) The method of claim 195, wherein a filter device is used for treatment of the collected first culture medium fluid and/or second fluid containing the product of interest.
197. (New) The method of claim 196, wherein said filter device comprises a microporous filter and/or an ultrafilter.
198. (New) The method of claim 196, wherein said filter device comprises a tangential flow filtration element.
199. (New) The method of claim 188, further comprising the step of filtering the collected first culture medium fluid and/or second fluid with a microporous filter and/or an ultrafilter to yield a filtered fluid containing the product of interest.
200. (New) The method of 188, further comprising the step of filtering the collected first culture medium fluid and/or second fluid with a tangential flow filtration element to yield a filtered or concentrated fluid containing the product of interest.
201. (New) The method of claim 188, wherein said tangential flow device comprises one or more hollow fiber membranes that defines an intercapillary space and an extracapillary space.
202. (New) A method for culturing cells and producing a product of interest comprising:
 - (a) providing a cell culture device comprising:
 - (i) a tangential flow device comprising:
 - (1) a housing enclosing an interior volume;
 - (2) one or more membranes separating the interior volume of the housing into a first set of one or more chambers and a second set of one or more chambers;
 - (3) at least one inlet port and at least one outlet port in fluid communication with the first set of one or more chambers; and
 - (4) at least one port in fluid communication with the second set of one or more chambers;

- (b) flowing a culture medium fluid through the first set of one or more chambers of the tangential flow device;
 - (c) culturing cells to produce the product of interest;
 - (d) monitoring components and/or conditions of the culture medium fluid;
 - (e) adding one or more substances selected from the group consisting of oxygen, carbon dioxide, serum, glucose, nutrients, and fresh culture medium into said culture medium fluid; and
 - (f) collecting the culture medium fluid that contains the product of interest.
203. (New) The method of claim 202, wherein the cell culture device comprises multiple reservoirs for storing said one or more substances and adding same into said culture medium fluid.
204. (New) The method of claim 202, further comprising the step of treating the collected culture medium fluid that contains the product of interest, by a process selected from the group consisting of concentrating, separating, and dialyzing.
205. (New) The method of claim 204, wherein a filter device is used for treatment of the collected culture medium fluid containing the product of interest.
206. (New) The method of claim 205, wherein said filter device comprises a microporous filter and/or an ultrafilter.
207. (New) The method of claim 205, wherein said filter device comprises a tangential flow filtration element.
208. (New) The method of claim 202, further comprising the step of filtering the collected culture medium fluid with a microporous filter and/or an ultrafilter to yield a filtered fluid containing the product of interest.
209. (New) The method of 202, further comprising the step of filtering the collected culture medium fluid with a tangential flow filtration element to yield a filtered or concentrated fluid containing the product of interest.
210. (New) The method of claim 202, wherein said tangential flow device comprises one or more hollow fiber membranes that define an intercapillary space and an extracapillary space.

211. (New) The method of claim 202, wherein flow direction of said culture medium fluid in said first set of one or more chambers of the tangential flow device is alternated by a switchable flow control device.
212. (New) The method of claim 211, wherein said switchable flow control device is selected from the group consisting of (i) reversible pump, (ii) 4-way valve, and (iii) a series of valves and (iv) reservoirs.
213. (New) The method of claim 159 wherein said mixing is accomplished through a circulation loop.
214. (New) The method of claim 159, wherein said mixing comprises flowing fluid from the extracapillary space of the tangential flow growth device through a path of fluid communication comprising a second reservoir.
215. (New) The method of claim 213, wherein said circulation loop comprises a switchable flow control device for controlling flow direction of the culture medium fluid therethrough.
216. (New) The method of claim 142, further comprising controlling the flow from the extracapillary space of the tangential flow growth device using a valve.
217. (New) The method of claim 142, further comprising controlling the flow into the extracapillary space of the tangential flow growth device using a valve.
218. (New) The method of claim 185 wherein said mixing is accomplished through a circulation loop.
219. (New) The method of claim 185 wherein said mixing comprises flowing fluid from the extracapillary space of the tangential flow growth device through a path of fluid communication comprising a second reservoir.
220. (New) The method of claim 142, further comprising the step of circulating culture medium fluid in the extracapillary space of the tangential flow growth device.
221. (New) The method of claim 220, wherein circulating further comprises controlling flow direction of the culture medium fluid through the extracapillary space.

- 222. (New) The method of claim 221, further comprising reversing flow direction of the culture medium fluid through the extracapillary space.
- 223. (New) The method of claim 222, wherein the reversing is switchably controlled.
- 224. (New) The method of claim 222, wherein the reversing is accomplished using a reversible pump.
- 225. (New) The method of claim 220, wherein said circulating further comprises flowing fluid from the extracapillary space of the tangential flow growth device through a path of fluid communication comprising a second reservoir.
- 226. (New) The method of claim 142, further comprising the step of recirculating culture medium fluid through the extracapillary space of the tangential flow growth device
- 227. (New) The method of claim 226, wherein recirculating further comprises controlling flow direction of the culture medium fluid through the extracapillary space.
- 228. (New) The method of claim 227, further comprising reversing flow direction of the culture medium fluid through the extracapillary space.
- 229. (New) The method of claim 228, wherein the reversing is switchably controlled.
- 230. (New) The method of claim 228, wherein the reversing is accomplished using a reversible pump.
- 231. (New) The method of claim 220, wherein said circulating further comprises flowing fluid from the extracapillary space of the tangential flow growth device through a path of fluid communication comprising a second reservoir.
- 232. (New) The method of claim 154, further comprising the step of treating the filtered fluid containing the product of interest, by a process selected from the group consisting of concentrating, separating, and dialyzing.
- 233. (New) The method of claim 199, further comprising the step of treating the filtered fluid containing the product of interest, by a process selected from the group consisting of concentrating, separating, and dialyzing.

234. (New) The method of claim 208, further comprising the step of treating the filtered fluid containing the product of interest, by a process selected from the group consisting of concentrating, separating, and dialyzing.
235. (New) The method of claim 188, wherein the culturing of cells occurs in the first set of one or more chambers of the tangential flow device.
236. (New) The method of claim 188, wherein the culturing of cells occurs in the second set of one or more chambers of the tangential flow device.
237. (New) A method of culturing cells and producing a product of interest, comprising (i) providing a multiplicity of passages bound by tangential flow membranes, including a first set of passages, a second set of passages, and a third set of passages, (ii) providing in one set of said first, second and third sets of passages cells which under culturing conditions produce the product of interest, (iii) flowing through another set of said first, second and third sets of passages a first medium essential to maintenance of said culturing conditions, (iv) flowing through a remaining set of said first, second and third sets of passages a second medium essential to maintenance of said culturing conditions, and (v) maintaining said culturing conditions while flowing said first medium through said another set of said first, second and third sets of passages, and flowing said second medium through said remaining set of said first, second and third sets of passages, whereby said cells in said one set of first, second and third sets of passages produce said product of interest.
238. (New) The method of claim 189, wherein flow direction of said second fluid in said second set of one or more chambers is alternated by an additional switchable flow control device.
239. (New) The method of claim 238, wherein said additional switchable flow control device is selected from the group consisting of (i) reversible pump, (ii) 4-way valve, and (iii) a series of valves and (iv) reservoirs.
240. (New) The method of claim 202, wherein the culturing of cells occurs in the first set of one or more chambers of the tangential flow device.

- 241. (New) The method of claim 202, wherein the culturing of cells occurs in the second set of one or more chambers of the tangential flow device.
- 242. (New) The method of claim 142, wherein said one or more substances are filtered before they are added to the culture medium fluid with a microporous filter and/or an ultrafilter.
- 243. (New) The method of claim 170, wherein said one or more substances are filtered before they are added to the culture medium fluid with a microporous filter and/or an ultrafilter.
- 244. (New) The method of claim 193, wherein said one or more substances are filtered before they are added to the culture medium fluid with a microporous filter and/or an ultrafilter.
- 245. (New) The method of claim 203, wherein said one or more substances are filtered before they are added to the culture medium fluid with a microporous filter and/or an ultrafilter.
- 246. (New) The method of claim 188, wherein cells are cultured in the tangential flow device.
- 247. (New) The method of claim 188, wherein cells are cultured in suspension and/or in an anchored state.
- 248. (New) The method of claim 202, wherein cells are cultured in the tangential flow device.
- 249. (New) The method of claim 202, wherein cells are cultured in suspension and/or in an anchored state.
- 250. (New) The method of claim 170, wherein the culture medium fluid is formulated for culturing cells selected from the group consisting of animal cells, human host cells, bacteria, mycobacteria, mycoplasma, and yeast.
- 251. (New) The method of claim 170, wherein the product of interest is selected from the group consisting of cells, bacteria, viruses, viral particles, intracellular products, extracellular products, IgG, immunoglobulins, hormones, proteins, amino acids, and macromolecules.

252. (New) The method of claim 188, wherein the culture medium fluid is formulated for culturing cells selected from the group consisting of animal cells, human host cells, bacteria, mycobacteria, mycoplasma, and yeast.
253. (New) The method of claim 188, wherein the product of interest is selected from the group consisting of cells, bacteria, viruses, viral particles, intracellular products, extracellular products, IgG, immunoglobulins, hormones, proteins, amino acids, and macromolecules.
254. (New) The method of claim 202, wherein the culture medium fluid is formulated for culturing cells selected from the group consisting of animal cells, human host cells, bacteria, mycobacteria, mycoplasma, and yeast.
255. (New) The method of claim 202, wherein the product of interest is selected from the group consisting of cells, bacteria, viruses, viral particles, intracellular products, extracellular products, IgG, immunoglobulins, hormones, proteins, amino acids, and macromolecules.

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